REMARKS

As a preliminary matter, Applicants appreciate the courtesy extended by the Examiner to discuss the Yamanaka reference on February 25, 2008. Applicants suggested to the Examiner that on page 5 of the outstanding Action, the Examiner inadvertently identified $CoCrPt_{17}B$ as a ferromagnetic atom-rich layer that is taught by Yamanaka. The Examiner agreed with Applicants that Yamanaka fails to teach this feature.

Claims 31, 33-38 and 43 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite. More specifically, the claims are indefinite because the limitation regarding a Pt content of the first ferromagnetic layer is not clear. In response, Applicants amended claims 31 and 43 to clarify that the Pt content of the first ferromagnetic layer is smaller than the Pt content of the magnetic layer by at least 7 atomic %. Based on these amendments, withdrawal of the §112 rejection is respectfully requested.

Claims 1, 5-17, and 41 stand rejected under 35 U.S.C. §102(a) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as being obvious over Yamanaka et al. (U.S. Publication No. 2002/0064689). In response, Applicants amended claims 1 and 41 of the present application to include the features of claims 15 and 17, and respectfully traverse the rejection based on these amendments.

Independent claims 1 and 41 of the present application now recite a magnetic recording medium comprising an exchange layer structure and a magnetic layer provided on the exchange layer structure. The exchange layer structure has a ferromagnetic layer and a nonmagnetic coupling layer provided on the ferromagnetic layer. The

ferromagnetic layer and the magnetic layer are exchange-coupled and having mutually antiparallel magnetizations. The ferromagnetic layer and the magnetic layer satisfy a relationship $Hc1' \geq Hc2'$, where $Hc1'$ denotes a dynamic coercivity of the ferromagnetic layer and $Hc2'$ denotes a dynamic coercivity of the magnetic layer. Each of the dynamic coercivities $Hc1'$ and $Hc2'$ refers to a coercivity for a case where a time required to switch a direction of an external magnetic field is on the order of sub-nano second to approximately one nano-second order.

In the present application, the ferromagnetic layer and the magnetic layer satisfies a relationship $Hc1 < Hc2$, where Hc1 denotes a static coercivity of the ferromagnetic layer and Hc2 denotes a static coercivity of the magnetic layer. Each of the static coercivities Hc1 and Hc2 refers to a coercivity for a case where a time required to switch a direction of an external magnetic field is on the order of seconds or greater. Each of the ferromagnetic layer and the magnetic layer is made of a material selected from a group consisting of CoCrPt and CoCrPt-M alloy, where M is an element or alloy thereof selected from a group consisting of B, Mo, Nb, Ta, W and Cu, a Pt content of the magnetic layer in atomic % is less than a Pt content of the ferromagnetic layer in atomic %, and the ferromagnetic layer has a thickness in a range of 1 nm to 10 nm.

In each of the independent claims of the present application, the Pt content of the ferromagnetic layer is larger than the Pt content of the magnetic layer. This is so that the coercivity (dynamic coercivity and static coercivity) of the ferromagnetic layer is set large. The thickness of the ferromagnetic layer is also set in the range of 1 nm to 10 nm so that the effects of the thermal instability increases and the static coercivity of the ferromagnetic layer decreases. Consequently, it is possible to make the dynamic

coercivity of the ferromagnetic layer larger than the dynamic coercivity of the magnetic layer, and also make the static coercivity of the ferromagnetic layer smaller than the static coercivity of the magnetic layer. (see FIG. 2 of the present application).

In contrast, in the magnetic recording medium shown in Fig. 1 of Yamanaka, the magnetic coupling layer 12 is disposed between the magnetization stabilizing layer 6 and the recording layer 16. Additionally, both the recording layer 16 and the magnetization stabilizing layer 6 are made of $CoCrPt_{12}B$ and have the same Pt content.

In the magnetic recording media shown in Figs. 10 and 13 of Yamanaka, the magnetic coupling layer 12 is disposed between the ferromagnetic atom-rich layer 78 and the recording layer 16. The recording layer 16 is made of $CoCrPt_{12}B$. The ferromagnetic atom-rich layer 78 is made of $CoPt_{17}$, and the Pt content of the ferromagnetic atom-rich layer 78 is larger than the Pt content of the recording layer 16.

First, the relationship between the Pt content of the ferromagnetic layer and the magnetic layer in independent claims 1 and 41 of the present application is completely different from the relationship between the Pt content of the magnetization stabilizing layer 6 and the recording layer 16 shown in Fig. 1 of Yamanaka. According to Yamanaka, both the recording layer 16 and the magnetization stabilizing layer 6 are made of $CoCrPt_{12}B$, and the Pt content is the same for each layer.

The structure made up of the magnetization stabilizing layer, the coupling layer and the recording layer improves thermal stability, but the total thickness increases because of the magnetization stabilizing layer. In other words, when the magnetization stabilizing layer is provided, it is more difficult for the recording magnetic field from the recording head to reach the magnetization stabilizing layer, and the overwrite

performance deteriorates. In general, the Pt content of the recording layer is made as large as possible in order to maintain the coercivity of the recording layer. Therefore, the Pt content of the magnetization stabilizing layer is made smaller than the Pt content of the recording layer in order to improve the thermal stability and the overwrite performance.

In the magnetic recording media recited in independent claims 1 and 41 of the present application, the relationship between the magnetic layer and the ferromagnetic layer, is reversed between the dynamic coercivity and the static coercivity (see FIG. 2 of the present application). In other words, $Hc1' \geq Hc2'$ and $Hc1 < Hc2$, so that both the overwrite performance and the NLTS performance are improved. In order to achieve such relationships, the Pt content of the ferromagnetic layer is made larger than the Pt content of the magnetic layer.

Yamanaka fails to teach or disclose the concept of "dynamic coercivity." For this reason, in the recording medium shown in Fig. 1 of Yamanaka, it is not known to make the Pt content of the magnetization stabilizing layer larger than the Pt content of the recording layer.

Second, the structure recited in independent claims 1 and 41 of the present application is completely different from the structures shown in Figs. 10 and 13 of Yamanaka. In Figs. 10 and 13 of Yamanaka, the Pt content of the ferromagnetic atom-rich layer 78 is larger than the Pt content of the recording layer 16. However, the composition of the ferromagnetic atom-rich layer 78 shown in Figs. 10 and 13 of Yamanaka is CoPt, which is completely different from CoCrPtB used for the ferromagnetic layer recited in independent claims 1 and 41 of the present application.

The CoCrPtB composition has Cr segregation around the micro Co magnetic grain. Because the Co magnetic grain forming the magnetization unit is very small, the Co magnetic grain is easily affected by the thermal instability. In the relationship between the magnetic field switching time and the coercivity, the coercivity (static coercivity) is easily affected by the thermal instability and becomes small when the magnetic field switching time is 1 second or more. On the other hand, when the magnetic field switching time is several nanoseconds or less, the Co magnetic grain is unaffected by the thermal instability, and the coercivity (dynamic coercivity) becomes large.

In contrast, the CoPt composition has no Cr segregation, and no micro Co magnetic grain is formed. For this reason, CoPt is virtually unaffected by the thermal instability, and the static coercivity and the dynamic coercivity remain approximately constant.

On the other hand, in the magnetic recording media recited in independent claims 1 and 41 of the present application, the relationship between the magnetic layer and the ferromagnetic layer is reversed between the dynamic coercivity and the static coercivity (see FIG. 2 of the present application). As discussed above, $Hc1' \geq Hc2'$ and $Hc1 < Hc2$, so that both the overwrite performance and the NLTS performance are improved. In order to achieve such relationships, the Pt content of the ferromagnetic layer is made larger than the Pt content of the magnetic layer.

If only the Pt content is considered in Figs. 10 and 13 of Yamanaka, the Pt content of the CoPt ferromagnetic atom-rich layer 78 is larger than the Pt content of the recording layer 16. But because the CoPt is virtually unaffected by the thermal instability and the coercivity is approximately constant regardless of the magnetic field switching

time, it is impossible in Yamanaka to make the dynamic coercivity of the ferromagnetic atom-rich layer larger than the dynamic coercivity of the recording layer and make the static coercivity of the ferromagnetic atom-rich layer smaller than the static coercivity of the recording layer.

Therefore, the structures shown in Figs. 10 and 13 of Yamanaka, which use CoPt for the ferromagnetic atom-rich layer 78, are completely different from the structures recited in independent claims 1 and 41 of the present application.

The Examiner asserts that Yamanaka discloses a ferromagnetic atom-rich layer 78 made of $CoCrPt_{17}B$. However, as discussed with the Examiner in the telephone interview of February 25, 2008, there is no disclosure in Yamanaka of such a feature, which the Examiner agreed. The ferromagnetic atom-rich layer 78 is initially Co-rich. Accordingly, it is contradictory to the disclosure of Yamanaka to form the ferromagnetic atom-rich layer 78 shown in Figs. 10 and 13 from $CoCrPt_{17}B$, as is evident from paragraph [0018] of Yamanaka.

Yamanaka fails to teach or suggest, among other things, a ferromagnetic layer made of a CoCrPt alloy (forming micro Co magnetic grains) and having a Pt content larger than a Pt content of the recording layer, as recited in independent claims 1 and 41 of the present application, or the other features now recited in the amended claims. For all the above reasons, withdrawal of the §103(a) rejections of claims 1, 5-14, 16, and 41 is respectfully requested.

For the foregoing reasons, applicants believe that this case is in condition for allowance, which is respectfully requested. The Examiner should call applicants' attorney if an interview would expedite prosecution.

Respectfully submitted,

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